LABCELL LTD
SPECIALIST INSTRUMENTATION

Environmental Instrumentation

New Instrumentation 1, 2

Soil Moisture Networks: GS3 Sensor, DS-2 Sonic Anemometer, ES-2 EC and Temp.

Hydrology: VSA, CTD Sensor and WP4C.

Canopy: SRS (PRI/NDVI).

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New Instrumentation

CTD Sensor

Water depth, temperature, and electrical conductivity.

Continuously monitor groundwater and surface water level changes along with electrical conductivity and temperature.

CTD Specifications

Water Depth
Range: 0 to 3.5 m.
Accuracy: ±0.2 % of span at 20°C.
Resolution: 1 mm.

Electrical Conductivity
Range: 0 to 120 dS/m (mS/cm).
Accuracy: ±0.01 dS/m or ±10%.
Resolution: 0.001 dS/m.

Temperature
Range: -40 to +50°C.*
Accuracy: ±1°C.
Resolution: 0.1°C.

Data Logger Compatibility
Em50/Em50G.
Call for compatibility of Data Loggers.

*Operating temperature 0 to 50˚C (Pressure transducer cannot be allowed to freeze while submerged).

For more details see page 25.

GS3 Sensor

New rugged design.

Stainless steel needles and epoxy casing make the GS3 the optimal sensor for long term soil water studies.

GS3 Specifications

Volumetric Water Content
Range: 0–100%.
Accuracy: ±3% in typical soils.
Resolution: 0.002 m3/m3

Electrical Conductivity
Range: 0 to 23 dS/m (bulk).
Accuracy: ±1%
Resolution: 0.001 dS/m

Temperature
Range: -40–80°C.
Accuracy: ±1°C.
Resolution: 0.1°C.

For more details see page 11.

SRS (PRI/NDVI)

Monitor the Normalised Difference Vegetation Index or the Photochemical Reflectance Index.

The SRS is designed for long-term autonomous measurement of vegetation indices under field conditions. One of its primary design goals is to reduce the cost of collecting high quality spatially distributed data in quantity over an entire growing season.

SRS Specifications

Calibration: NIST traceable calibration known spectral radiance (W $m^{-2}nm^{-1}$) or irradiance (W $m^{-2}nm^{-1}sr^{-1}$).
Foreoptics: (1) Cosine correcting Teflon diffuser, hemispherical field of view (2) Field stop, 20° field of view.
PRI Wavebands: 531±3 and 570±3 nm peak wavelengths, with 10 nm full width half maximum (FWHM) band widths
NDVI Wavebands: 630±5 and 800±5 nm peak wavelengths, with 50 nm and 40 nm full width half maximum (FWHM) band widths.
Cable Length: 5 m standard, custom cable length available upon request.

Operating Temperature Range: 40 to 50°C.
Accuracy: 10% or better for spectral irradiance and radiance values.
Measurement Time: < 300 ms.
Dimensions: 43 x 40 x 27mm.
Power: 3.6 to 15 VDC, 4 mA (reading, 300 ms), 30µA (quiescent).
Connector Type: 3.5 mm (stereo) plug or stripped and tinned lead wires.
Communication: SDI-12 digital sensor.

Vapour Sorption Analyser

Automated soil water characterise curves.

Generates up to 200 data points (water potential vs. water content) for both adsorption and desorption within 24-48 hours. The VSA works in the dry (-10 to -475 MPa) range. Create automated soil-water characteristic curves and generate all the correlations with clay activity, surface area, and swelling potential.

Hold humidity constant and look at the way soil takes up water into its crystal structure (2:1 clays) and monitor water content change over time.

VSA Specifications

Range: -10 to -475 MPa.
Accuracy: ±1 MPa or ±1%.
Temperature operating range: 15 to 60°C.
Size: W 25.4 x L 38.1 x H 30.5 cm (10x15x12 in.)
Weight: 19 kg.

For more details see page 21.

Watch a video on innovative ways the VSA is being used in soils applications.
learn.decagon.com/VSA

New

DS-2

Wind speed and direction.

The DS-2 is a two dimensional sonic anemometer that measures wind speed and wind direction.
Wind speed and wind direction are fundamental measurements necessary for a wide range of agricultural, forestry and micro-meteorological research and management applications.
The DS-2 has no moving parts, does not require maintenance or recalibration and is capable of making high accuracy measurements, even at low wind speeds.

DS-2 Specifications

Wind speed range: 0 to 30 m/s.
Wind speed resolution: 0.01 m/s.
Wind speed accuracy: 0.30 m/s or < 3%, which ever is greater.
Wind direction range: 0 to 359°.
Wind direction resolution: 1°.
Wind direction accuracy: ± 3°.
Maximum sampling speed: 1 Hz.
Operating temperature range: 40 to +50°C.
Physical dimensions diameter: 100 mm,
Overall height: 155 mm.
Cable length: 5 m standard, custom length available upon request.
Outputs: (3) Wind speed, gust speed, wind direction or vector.

ES-2

Temperature and electrical conductivity.

The ES-2 allows you to obtain additional EC measurements for salt balance studies and nutrient monitoring. Monitor EC in pipes, tanks or wells.

ES-2 Specifications

Electrical Conductivity Range: 0 to 120 dS/m (mS/cm).
Accuracy: ±0.01 dS/m or ±10% (which ever is greater).

Resolution: 0.001 dS/m.
Temperature Range: -40 to +50°C.
Accuracy: ±1°C.
Resolution: 0.1°C.

WP4C

Lab water potential measurements.

The WP4C measures water potential by determining the relative humidity of the air above a sample in a closed chamber (an AOAC-approved method, conforms to ASTM 6836).

New features

- **Precise Mode** -Verifies full equilibrium before displaying a final reading.
- **Speedy Equilibration** -New hydrophobic teflon impregnated nickel alloy sample chamber coating reduces equilibration time.
- **Finely-Tuned Adjustments** -New algorithms allow precision calibration and ±0.05 MPa (or better) accuracy.
- **Better range and accuracy** -Resolves temperatures to a thousandth of a degree to push the functional range to -0.1 MPa.

WP4C Specifications

Operating environment: 5 to 43°C (41 to 110°F).
Temperature control: 15 to 40°C ±0.2°C.
Sensors: 1. Infrared temperature 2. Chilled-mirror dew point.
Range: 0 to -300 MPa.
Accuracy: ±0.05 MPa from 0 to -5 MPa, ±1% from -5 to -300 MPa.
Read time: Typically 5 to 10 minutes.
Interface cable: Serial cable (included).

For more details see page 19.

Data communications: RS232 compatible, 8-bit ASCII code, 9600 baud, no parity, 1 stop bit.
Weight: 3.2 kg (5.2 kg shipping weight).
Universal power: 110-220V AC, 50/60 Hz.
Sample dish* capacity: 7 ml recommended (15ml full).
Calibration standard: 0.5 molal KCl (-2.22 MPa).

*25 plastic cups and 10 stainless steel cups included.

Watch R&D scientist Dr. Doug Cobos discuss the advancements made with the new WP4C.
learn.decagon.com/WP4C

Porometer Research for Everyone

High quality data without fans, tubes, or pumps.

Steady State design makes accurate stomatal conductance measurements affordable and practical for everyday research. Use stomatal conductance to evaluate plant water use, quantify water stress, and compare physiological response of different varieties.

Applications

- Water Stress Measurements.
- Variety Testing & Comparison.
- Fundamental Research on Stomatal Function.
- Teaching and Student Labs.

Benefits

- Automatic sampling mode eliminates user subjectivity.
- Accurate Steady-State measurement.
- No tubes, pumps, or fans.

Leaf Porometer Specifications

Conductance range: 0 to 1000 mmol m^{-2} s^{-1}.
Accuracy: ±10%.
Operating environment: 5 to 40ºC, 10 to 90% RH.
Units: mmol m^{-2} s^{-1}, m^2 s mol^{-1}, s/m.
Measurement: Aperture measurement 6.3 mm.
Sensor head cable length: 1.2 m (4 ft.).
Measurement time in auto mode: 30s.
Power: 4 AA alkaline cells.
Data storage: 4095 Measurements in flash memory

LEARN Online

learn.decagon.com/porometer

Watch a 3 minute video to see how the SC-1 uses first-principle methods to measure stomatal conductance.

Mathematics of the Steady State Porometer

Decagon's Steady State Porometer measures stomatal conductance using a sensor head with a fixed diffusion path to the leaf. It measures the vapour concentration at two different locations in the diffusion path. It computes vapor flux from the vapor concentration measurements and the known conductance of the diffusion path using the following equation:

$$\frac{C_{vL} - C_{v1}}{R_{vs} + R_1} = \frac{C_{v1} - C_{v2}}{R_2}$$

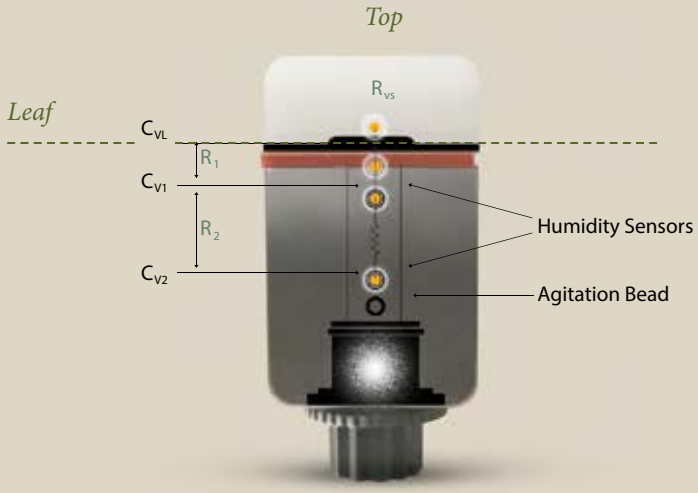
Where C_{vL} is the vapour concentration at the leaf, C_{v1} and C_{v2} are the concentrations at the two sensor locations, R_{vs} is the stomatal resistance, R_1 is the resistance between the leaf and the first sensor, and R_2 is the resistance between the two sensors. If the temperatures of the two sensors are the same, vapour concentration can be replaced with relative humidity, giving

$$R_{vs} = \frac{1 - h_1}{h_2 - h_1} R_2 - R_1$$

Conductance is the reciprocal of resistance, so

$$C_{vs} = \frac{1}{R_{vs}}$$

FRONT: INSIDE LOOK



new

Canopy Measurements PAR/LAI

Measure PAR and LAI with the AccuPar LP-80 Ceptometer.

Use PAR Data to estimate biomass production without destroying the crop (see details at right). Measure photosynthetically active radiation (PAR) and get leaf area index (LAI) values simultaneously in real time. Store approximately 9000 data points manually by pressing a button or automatically in unattended sampling mode.

LEARN Online

learn.decagon.com/LP80

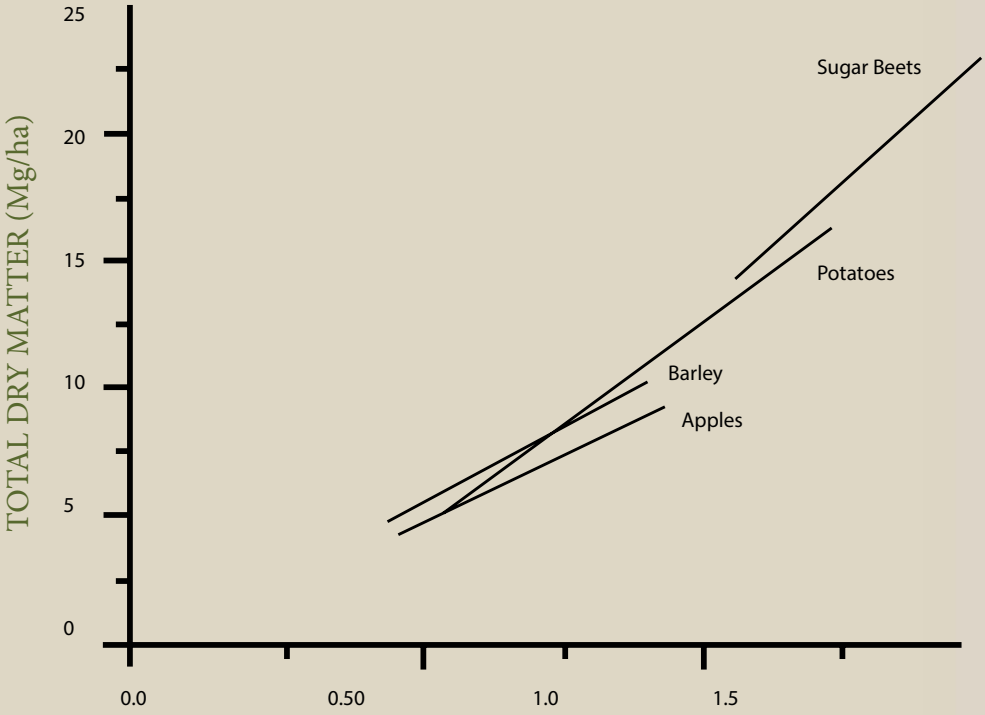
Watch a two minute video on measuring PAR and LAI with the AccuPar LP-80.

AccuPAR LP-80 Specifications

Operating environment: 0 to 5°C, 0 to 100% relative humidity.
Probe length: 86.5 cm.
Number of sensors: 80.
Overall length: 102 cm (40.25 in).
Microcontroller dimensions: 15.8 x 9.5 x 3.3 cm (6.2 x 3.75 x 1.3 in).
PAR range: 0 to >2,500 µmol $m^{-2} s^{-1}$.
Resolution: 1 µmol $m^{-2} s^{-1}$.
Minimum spatial resolution: 1 cm.
Data storage capacity: 1MB RAM, 9000 readings.
Unattended logging interval: User selectable, between 1 and 60 minutes.
Instrument weight: 1.22 kg (2.7 lbs).
Data retrieval: Direct via RS-232 cable.
Power: 4 AA Alkaline cells.
External PAR sensor connector: Locking 3-pin circular connector.
Extension cable option: 7.6 m (25 ft).

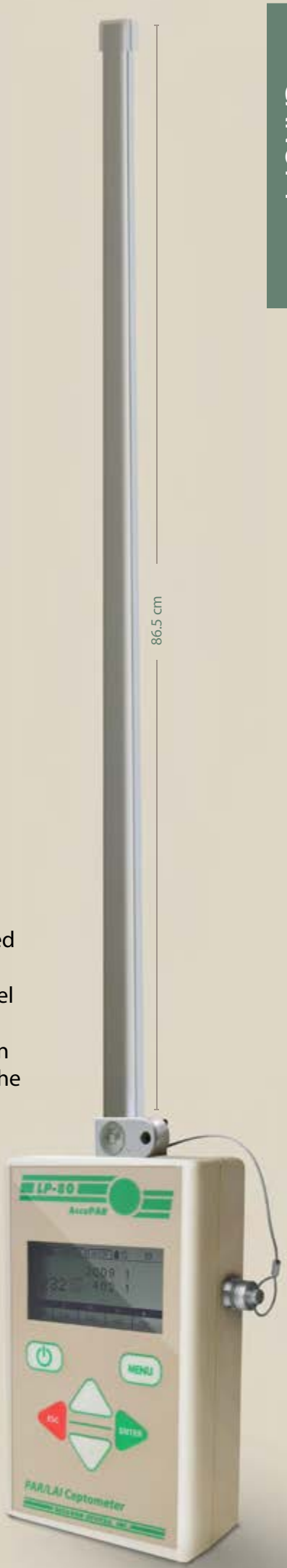
Included Accessories

- External PAR sensor.
  2 metre cable with connector for direct connection to the ceptometer's external port. Calibrated to provide an output of about 0.1 mV per µmol $m^{-2} s^{-1}$ (calibration label provided).
- RS-232 cable.
  For interfacing between your computer and the AccuPAR.
- Carrying case.
  Polyethylene hardened case with custom foam cutouts allow the instrument and its accessories to be safely stored inside. 3.6 kg, 11.8 x 24 x 109 cm.



Nondestructive Biomass Prediction

The conversion of light energy and atmospheric carbon dioxide to plant biomass is fundamentally important to both agricultural and natural ecosystems. The detailed biophysical and biochemical processes by which this occurs are well understood. At a less detailed level, though, it is often useful to have a simple model that can be used to understand and analyse parts of an ecosystem. Such a model has been provided by Monteith (1977). He observed that when biomass accumulation by a plant community is plotted as a function of the accumulated solar radiation intercepted by the community, the result is a straight line. Figure 1 shows Monteith's results.



I.LEARN

learn.decagon.com/assimilation

For more information view the free virtual seminar "Model Carbon Assimilation By Plants."

Built-to-order Leaf Wetness Sensor

Detect leaf wetness duration with a sensitive, calibrated, standardised sensor.

Many diseases affect plants only when moisture is present on the leaf surface. The Dielectric Leaf Wetness Sensor determines the presence and duration of wetness on a leaf's surface, enabling both researchers and growers to forecast disease and protect plant canopies. The Decagon Leaf Wetness Sensor approximates the thermal mass and radiative properties of leaves to closely mimic the wetness state of a real leaf. Because the sensor does not take resistance based measurements, it requires no painting or user calibration, and has the ability to detect ice formation as well.

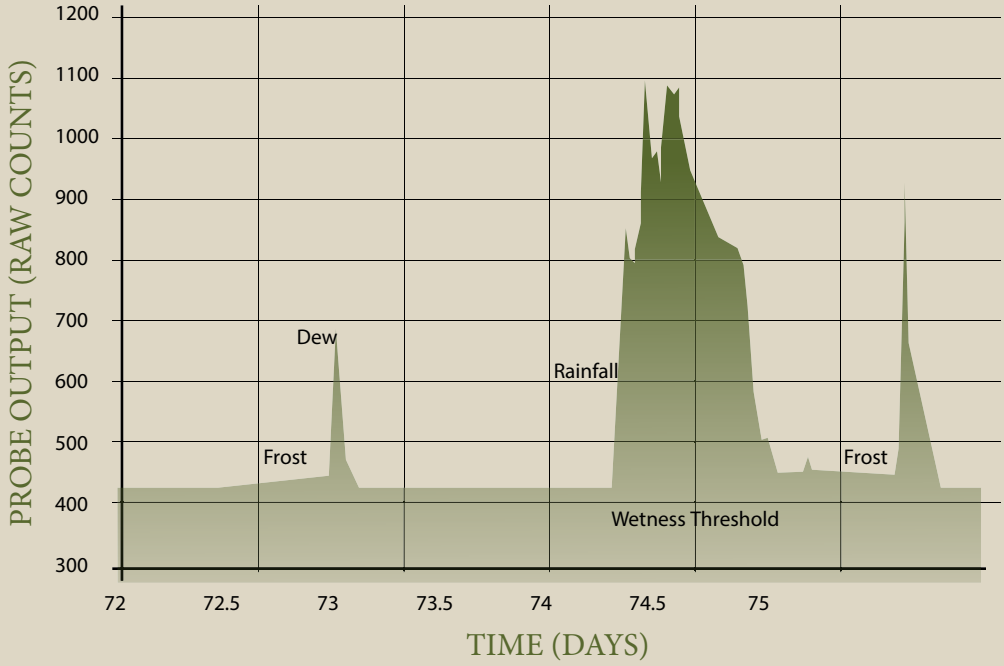
Applications

- Disease forecasting and modelling.
- Ecological and agricultural research.

Specifications

Measurement time: 10 ms.
Power: 2.5 VDC @ 10 mA to 5 VDC @ 7 mA.
Output: 250 to 1500 mV.
Operating environment: -20 to 60°C.
Expected lifetime: 2+ years continuous use.
Probe dimensions: 1.2 x 5.8 x 0.075 cm (4.4 x 2.3 x 0.029 in)
Cable length: 5 m standard, custom length available.
Connector type: 3.5 mm plug.
Data logger compatibility: (not exclusive) – Decagon Em50, Em50G, Campbell Scientific CR10, 10X, 21X, 23X, 1000, 3000 and 3500.

High resolution sensor distinguishes between frost, dew and rain.



▶ Because ice has a much lower dielectric content than that of liquid, the sensor output from frost will be much lower than that from a similar amount of rain or dew

When read with the Em50 data logger, the LWS outputs 445 raw counts when dry. When the sensor is totally wet, as in heavy rain, the signal can range up to around 1400 counts. Varying amounts of water on the surface will cause sensor output proportional to the amount of water on the sensor's surface.

LEARN Online

learn.decagon.com/LWS

Watch a 4 minute video on the unique measuring capabilities of the Leaf Wetness Sensor.

Soil Moisture Systems

Big Networks for Big Science.

Available Sensors

See the new rugged soil moisture sensor line plus standard soil moisture probes and a range of above-ground sensors.

- Electrical interface for all sensors: 3.5mm plug or 3-wire.
- All sensors plug and log with Decagon Data Loggers.
- All Sensors are compatible with most CSI Data Loggers. Call to verify compatibility.

Details on page 11

Data Loggers

Hassle-free access to your data—set up the logger and start logging in less than 30 minutes.

Details on page 13

Software

DataTrac 3 provides you with an almost real-time graphical picture of your data.

Details on page 15

Your soil moisture, delivered.

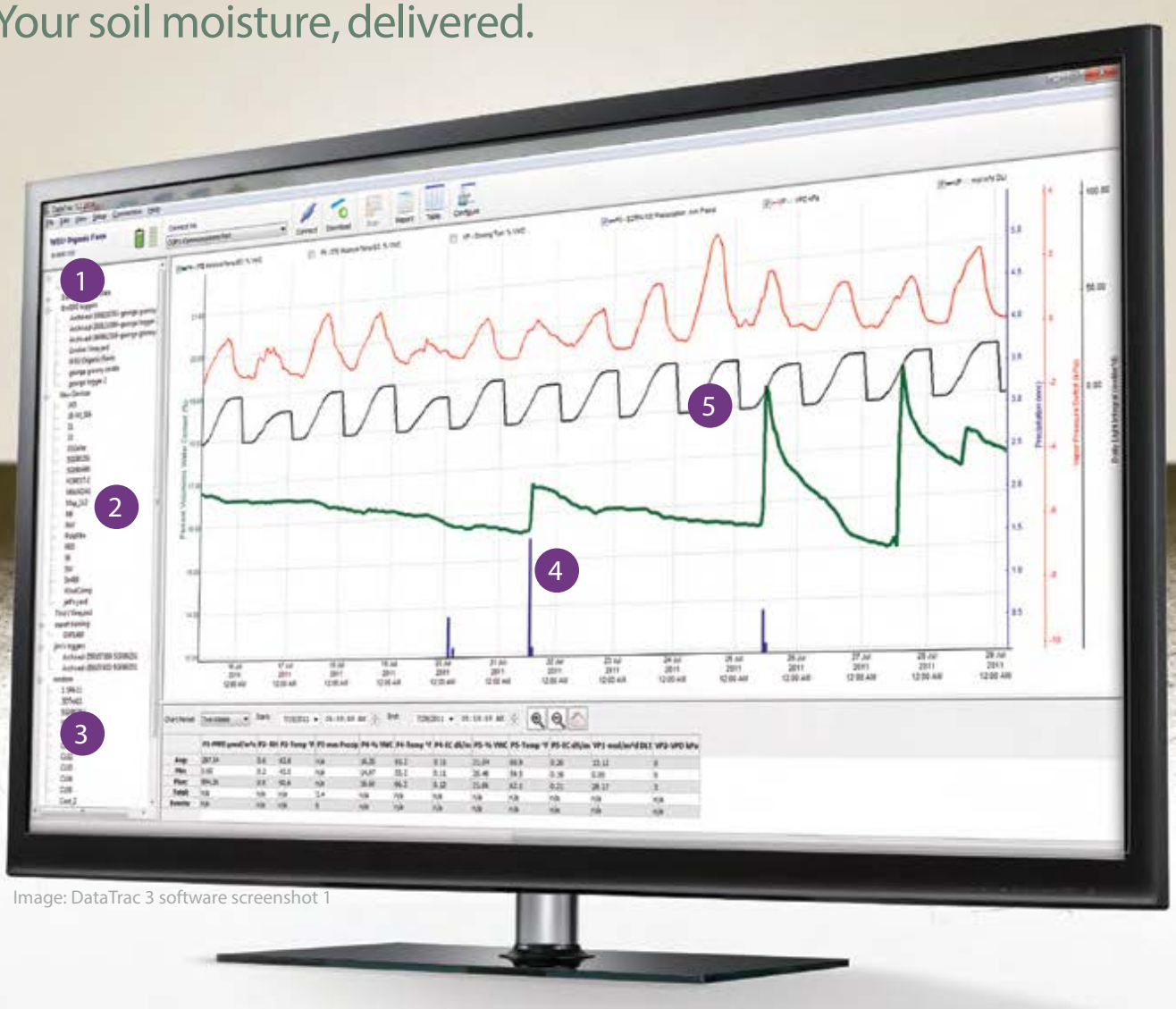


Image: DataTrac 3 software screenshot 1

1 KNOW

Know the status of the loggers in your network. When you click on a logger in the device tree, you'll see all of the data from the logger, the battery level, and the transmission strength.

2 MANAGE

Manage your wireless network. The device tree lets you organise your loggers for quick data access.

3 SHARE

Share data with colleagues. When you allow colleagues to subscribe to your data stream, they can view all data and download a copy for analysis.

4 CREATE

Create meaningful metrics such as daily light integral and vapour pressure deficit.

5 LEARN

Learn what's driving changes in soil moisture by seeing all of your metrics on one graph.

Soil Moisture Sensors

Measurement & Benefits	Range	Accuracy
GS3 Volumetric Water Content, Electrical Conductivity, Dielectric Permittivity, Temperature. **Benefits:** Optimized for greenhouse and nursery substrates.	**VWC:** 0–100%. **Apparent dielectric permittivity (ε_a):** 1 (air) to 80. EC: 0 to 23 dS/m (bulk). **Temperature:**-40 to 50ºC.	**(ε_a):** ±1 ε_a (unitless) from 1–40 (soil range), ±15% from 40-80. **EC:** ±10% from 0 to 10 dS/m, user calibration required above 10 dS/m. **Temperature:**±1ºC.
EC-5 Volumetric Water Content. **Benefits:** All purpose, least expensive soil moisture sensor.	**VWC:** 0–100%.	**VWC:** ±3%, typical mineral soils up to 8 dS/m. **VWC Rockwool:** ±3% VWC, 0.5 to 8 dS/m. **VWC Potting soil:** ±3% VWC, 3 to 14 dS/m.
10HS Volumetric Water Content, Dielectric Permittivity. **Benefits:** Largest volume of influence decreases effects of heterogeneity.	**VWC:** 0–57%. **Apparent dielectric permittivity (ε_a):** 1 (air) to 50.	**VWC:** ±3%, typical mineral soils up to 8 dS/m. **(ε_a):** ±1 from ε_a of 2 to 10. ±15 from ε_a of 10 to 50.
5TE Volumetric Water Content, Electrical Conductivity, Dielectric Permittivity, Temperature. **Benefits:** Manage salts and fertilisers in your system.dependencies in your study.	**VWC:** 0–100%. **Apparent dielectric permittivity (ε_a):** 1 (air) to 80. **EC:** 0 to 23 dS/m (bulk). **Temperature:** -40 to 50ºC	**VWC:** ±3%, typical mineral soils up to 8 dS/m. **(ε_a):** ±1 ε_a (unitless) from 1–40 (soil range) ±15% from 40–80. **Bulk EC:** ±10%. **Temperature:** ±1ºC.
5TM Volumetric Water Content, Dielectric Permittvity, Temperature. **Benefits:** Include temperature dependencies in your study.	**VWC:** 0–100%. **Apparent dielectric permittivity (ε_a):** 1 (air) to 80. **Temperature:** -40 to 50ºC.	**VWC:** ±3%, typical mineral soils up to 8 dS/m. **(ε_a):** ±1 ε_a (unitless) from 1–40 (soil range) ±15% from 40–80. **Temperature: ±1°C.**
MPS-2 Soil Matric Potential, Temperature. **Benefits:** Maintenance-free water potential and soil temperature monitoring measurements that do not drift over time.	**Soil water potential(Ψ):** -10 to -500kPa (pF 1.71 to pF 3.71). **Temperature:** -40°C to 50°C.	**Ψ:** ±25% of reading from -5 to -100 kPa* **Temperature:** ±1ºC. **Accuracy significantly improved with custom calibration.*

Environmental Sensors

Characterise the environment above the soil surface.

Cup Anemometer

The anemometer measures both wind speed (using windcups and a magnetic switch) and wind direction (with wind vane). Includes sealed stainless steel bearings for long life. The range and accuracy specifications of this unit have been verified in wind-tunnel tests (information available upon request).

Resolution: 1 mph (0.45 m/s).
Range: 0 to 129 mph.
Accuracy: ±5%.

Pyranometer Model PYR/PAR Photon Flux Sensor

Completely water proof, submersible and designed for continuous outdoor use.

Cable length: 1 m.
Range PAR: 0 to 2000 µmol/m^{2}s.
Range PYR: 0 to 1750 Wm^{-2}.
Dimensions: 24 mm diameter, 29 mm deep.
Accuracy: ±5%.

RT-1

The rugged RT-1 soil temperature sensor is an easy-to-use sensor for measuring the temperature of soil or other materials. The sensor is stainless steel, completely water proof, submersible, and designed for continuous outdoor use.

Resolution: 0.1°C.
Range: -40 to 80°C.
Temperature accuracy ±1°C.
Type: Thermistor.
Output: 320–1000 mV @ 3V excitation.

Temp RH

Durable sensor measures relative humidity and temperature, and outputs both values as digital signals.

Probe RH range: 0 to 100% RH.
Temperature range: -40 to 60°C.
Temperature accuracy: ±1°C.
RH accuracy: ±2% from 10–90% RH, ±3% from 0–10% RH, and 90–100% RH.

ECRN-50

Small self-emptying rain gauge for measuring irrigation events or precipitation.

Resolution: 1 mm.
Funnel size: 5x10 cm.

ECRN-100

High-resolution rain gauge with two internal tipping spoons.

Resolution: 0.2 mm.
Funnel size: 17x14.2 cm.

ProCheck

Indispensable tool for large installations.
This staff favourite allows you to:

- Check sensors quickly during installation. Know if the installation is good before you start backfilling.
- Troubleshoot sensors in the field.
- Program SDI-12 addresses.

All sensors are plug-and-log with Em50 series data loggers.

Details on page 13

Data Loggers

Spend more time with your data– not your data logger.

Can it really be that easy?

LEARN Online

learn.decagon.com/27minutes

Watch Ross, a research associate, set up an Em50G without any preparation.

Just plug in any Decagon sensor, set your sensor type and measurement intervals using drop down menus, and start logging data.

Pre-programmed

No user programming necessary.

Powered by

5 AA Batteries. No external power source required.

Weatherproof

No extra enclosure needed.

Specifications

Data Logger: Universal Specifications.
Channels: 5.
Interface: Each channel can accept all digital, analogue, or pulse Decagon sensors.
Storage: >36,000 scans, each scan includes logger name, date, time, and sensor measurements.
Scan interval:
1 measurement/minute to 1 measurement/day (minimum Em50G scan interval every 5 minutes).
Power: 5 AA batteries.
Enclosure rating: IP55, NEMA3.

Em50G

Options

Cellular transmission worldwide, Direct Connect.

Storage

Automatic logger storage (36,000 scans), Decagon data server, Local Datatrac 3 storage with every download.

Applications

Large-scale and small-scale studies where daily access to data is advantageous.

Studies with multiple researchers requiring access to the same data set.

Em50

Options

Direct Connect.

Storage

Logger storage (36,000 scans), local DataTrac 3 storage with every download.

Applications

Studies where data access is only necessary once or twice per year.

Complete Soil Moisture Analysis– DataTrac 3

DataTrac 3 transforms endless columns and rows of raw data into meaningful, easily-interpreted graphs.

TRY IT FREE!

Download your Free 30-day trial.

learn.decagon.com/datatrac3

1. Educate and inform your team efficiently. DataTrac 3's graphics reduce the time and expertise needed to understand soil moisture data.

2. Adjust date ranges, add or subtract data from specific sensors, and change target bands to illustrate and explore your findings.

3. Watch your data in real time. DataTrac 3 updates automatically while it's running and every time it starts up.

4. Add notes and ideas to the data stream. Comments and reminders can help you make sense of a growing season's data later.

5. Automatically collect data from your Em50G Data loggers. All data—including manually collected data—will be automatically organised and added to your files chronologically.

6. Use Growing Tools to combine data streams and track meaningful indicators. For example, plot vapour pressure deficit instead of just temperature and humidity. Or track growing degree days, plant available water, pore water EC, etc.

Data On The Go

Demo the free Em50G Webviewer.

new

Webviewer is free software with the following benefits:

- View your Em50G data on any mobile device with internet.
- Easily share up-to-date data with colleagues– no spreadsheets needed!
- Check on your system anytime, anywhere.
- Check most recent data and battery level from all of your loggers.
- Data from the previous week is always shown on the graph for quick updates.
- Share your data with anyone– without having to purchase additional software.

Em50Gwebviewer.com

Access to your data has never been so easy.

Manage Irrigation

Without Leaving Your Desk

See both how much water is in the soil and how much of that water is available to plants. Soil moisture sensors only measure volumetric water content. Use the matric potential sensor to monitor plant water availability. Fast-response soil moisture sensors let you track plant water use in real time and set an accurate full-point that minimises wasted water.

1

Know when to turn the irrigation on and off with customisable target zones.

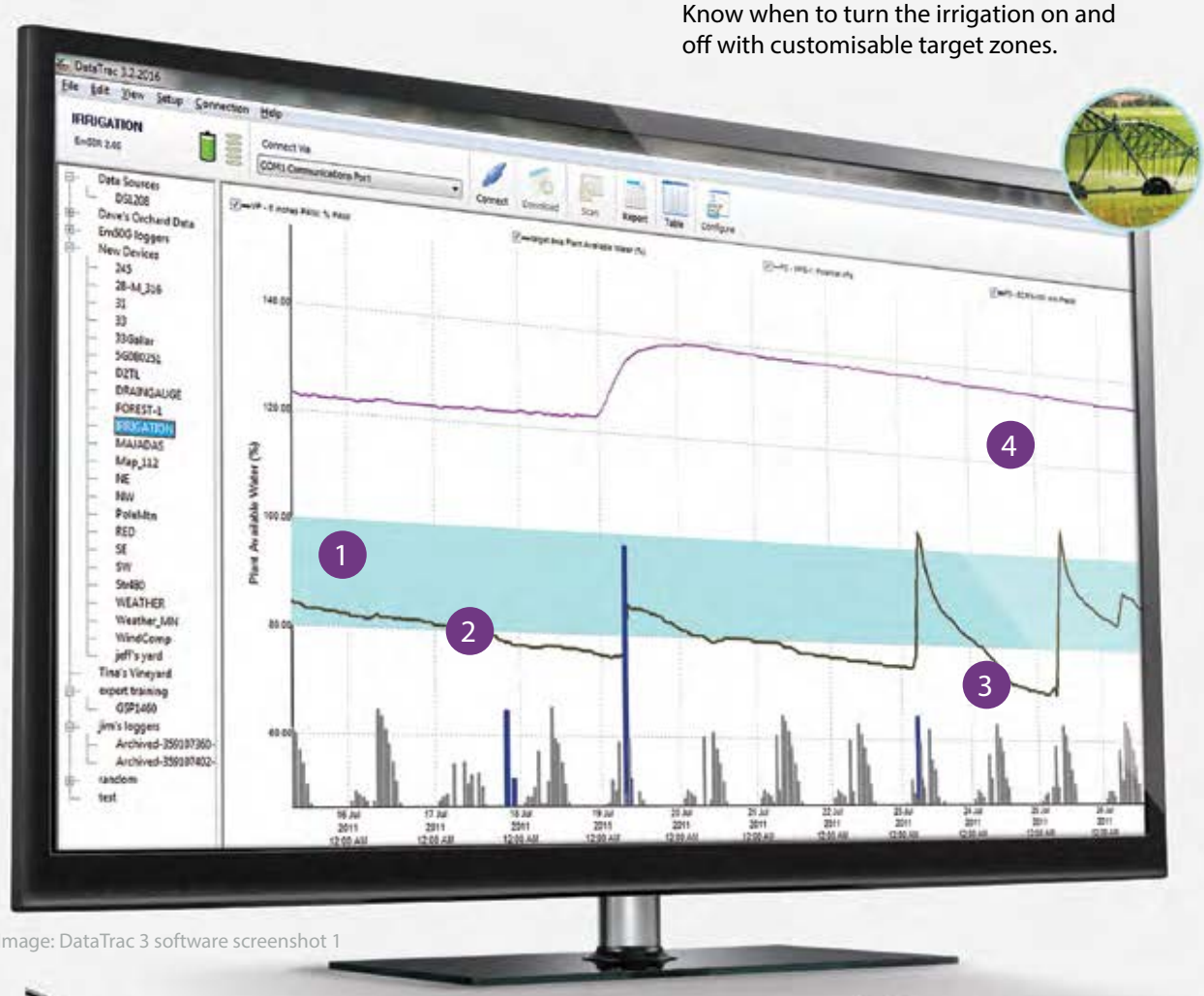


Image: DataTrac 3 software screenshot 1

2

Track water in the root zone with Decagon soil moisture sensors. Plant available water is calculated automatically with DataTrac 3's Growing Tools option.

3

Rain gauges and irrigation pressure switch data on the same graph as soil moisture show how each event affects the water available to your plants.

4

Focus on key stress levels with the extended range water potential sensor.

LEARN Online

learn.decagon.com/vineyard

See how a viticulturist uses the new features in DataTrac 3 to maximize their yield.

Close Your Water Balance

With precipitation, soil water storage, and deep drainage.

Two tough components of the water balance are storage and deep percolation. Collect the data you need to calculate water input, storage, and drainage in the vadose zone. Measure deep drainage rather than estimating to reduce errors in water balance calculation.

Image: DataTrac 3 software screenshot 2

5

Quantify drainage past the root zone with the Drain Gauge G3. Water samples are also held in the Drain Gauge's reservoir for chemical flux calculations.

6

Add local precipitation data to your calculations for water contributions to the root zone.

7

Measure soil water storage in the root zone with 5TM. Sensors can be placed throughout the soil profile to further quantify soil profile water storage.

Essential Water Potential Data

Make fast, accurate water potential measurements in the lab.

Measure the water potential of soil, soilless substrate, plant tissue, or any porous material in 5 to 10 minutes.

The WP4C measures water potential by determining the relative humidity of the air above a sample in a closed chamber (an AOAC-approved method, conforms to ASTM 6836).

Applications

- Soil moisture characteristic curves.
- Root zone water potential profiles.
- Expansive soil characterization.
- Leaf water potential.
- Seed priming.
- Seed water relations.

Specifications

Operating environment: 5 to 43°C (41 to 110°F).
Temperature control: 15 to 40°C ±0.2°C.
Sensors: 1. Infrared temperature 2. Chilled-mirror dewpoint.
Range: 0 to -300 MPa*.
Accuracy: ±0.05 MPa from 0 to -5 MPa, ±1% from -5 to -300 MPa.
Read time: Typically 5 to 10 minutes.
Interface cable: Serial cable (included).
Data communications: RS232 compatible, 8-bit ASCII code, 9600 baud, no parity, 1 stop bit.
Weight: 3.2 kg (5.2 kg shipping weight).
Universal power: 110-220V AC, 50/60Hz.
Sample dish capacity: 7 ml recommended (15ml full).
25 plastic cups and 10 stainless steel cups included
Calibration standard: 0.5 molal KCl (-2.22MPa).

New Features

- Precise Mode—verifies full equilibrium before displaying a final reading.
- Speedy Equilibration—new hydrophobic teflon impregnated nickel alloy sample chamber coating reduces equilibration time.
- Finely-Tuned Adjustments—new algorithms allow precision calibration and ±0.05 MPa (or better) accuracy.
- Better Range and Accuracy—resolves temperatures to a thousandth of a degree to push the functional range to -0.1 MPa.

new

LEARN Online

learn.decagon.com/WP4C

Watch R&D scientist Dr. Doug Cobos discuss the advancements made with the new WP4C.

* WP4C will read to 0 MPa, but readings of samples wetter than -0.1 MPa will have an increasing, and typically unacceptable, percentage of error. Some users may be able to make useful measurements in samples wetter than -0.1 MPa using special techniques. For more information, see the WP4C User Manual.

Measure Soil Hydraulic Conductivity

Quantify spatial variability of soil hydraulic conductivity.

Water movement in soil is spatially variable. The Mini Disk Infiltrometer is a quick way to test hydraulic conductivity and infiltration rates.

Backpackable

Small, compact, and simple, the Mini Disk Infiltrometer is a true field instrument. It can be tossed into a backpack with a bottle of water.

Quick Setup

Just fill the reservoir, set the suction, and start measuring infiltration. You don't have to pre-saturate the disk.

Straightforward Calculations

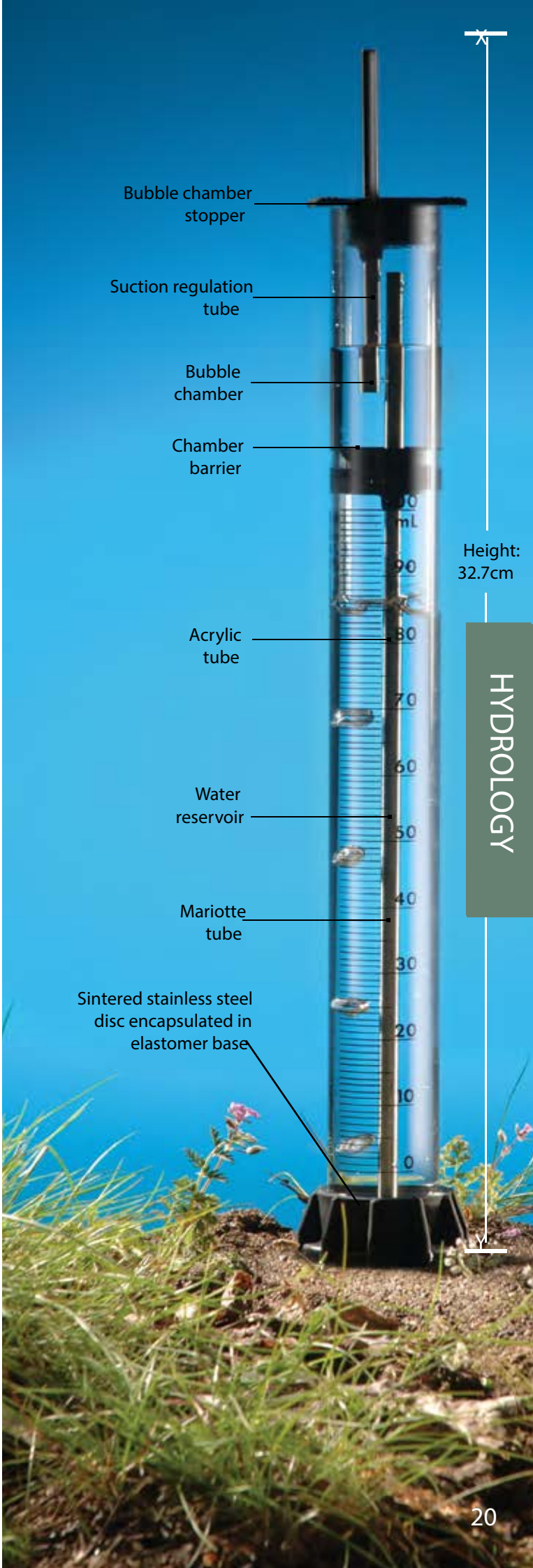
Enter infiltration and elapsed time data in the included spreadsheet calculator to find hydraulic conductivity.

Reliable

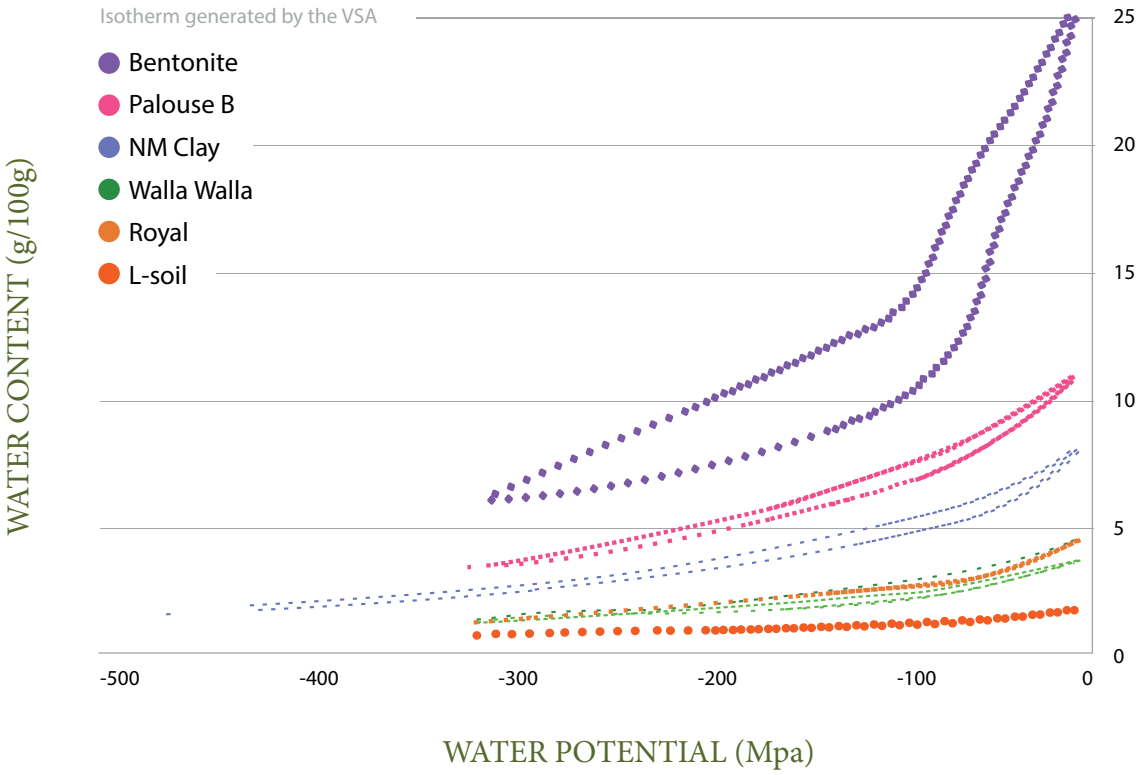
Both scientists and technicians have used the Mini Disk Infiltrometer to design irrigation systems, demonstrate hydraulic conductivity, evaluate erosion hazard, and gauge the impact of forest fires.

Specifications

Total Length: 32.7 cm.
Suction Range: 0.5 to 7 cm of suction.
Water Volume for Operation: 135 mL.
Diameter of Sintered Stainless Steel Disc: 4.5 cm diameter, 3 mm width.



Vapor Sorption Analyzer



Create Static and Dynamic Isotherms Automatically

Vapour Sorption Analys

er.

LEARN Online

learn.decagon.com/VSA

Watch a video on innovative ways the VSA is being used in soils applications.

new

Generates up to 200 data points (water potential vs. water content) for both adsorption and desorption within 24-48 hours.

The VSA works in the dry (-10 to -475 MPa) range. Create automated soil-water characteristic curves and generate all the correlations with clay activity, surface area, and swelling potential.

Hold humidity constant and look at the way soil takes up water into its crystal structure (2:1 clays) and monitor water content change over time.

Specifications

Range: -10 to -475 MPa.

Accuracy ±1 MPa or ±1%.

Temperature operating range: 15 to 40°C.

Size: W 25.4 x L 38.1 x H 30.5 cm (10x15x12 in.)

Weight: 19 kg.

Benefits

- Rapid isotherm generation.
- Fast expansive soil characterization

Monitor Groundwater Leaching

Measure Deep Percolation Rates Directly.

Determine the volume of water and chemicals draining from the vadose zone into groundwater. The Drain Gauge measures drainage flux in unsaturated soils and collects soil water samples for chemical analysis.

An ingenious duct and wick design maintains a flow rate within the gauge equivalent to that in surrounding soil. A surface port allows you to draw out samples to analyse for chemicals, fertilisers, and other contaminants.

Applications

- Waste landfill sites: advise operators when drainage is occurring and where cover systems need to be improved.
- Maximization of food processing waste applications; monitoring water drainage rates and water quality below the root zone.
- Environmental research; measuring percolation and recharge rates.
- Farming operations: measure and control irrigation during a cropping season.
- Recreational facilities (such as golf courses) : measure and control excess water and nutrient losses.

Drain Gauge G2
FLOWTHROUGH TECHNOLOGY

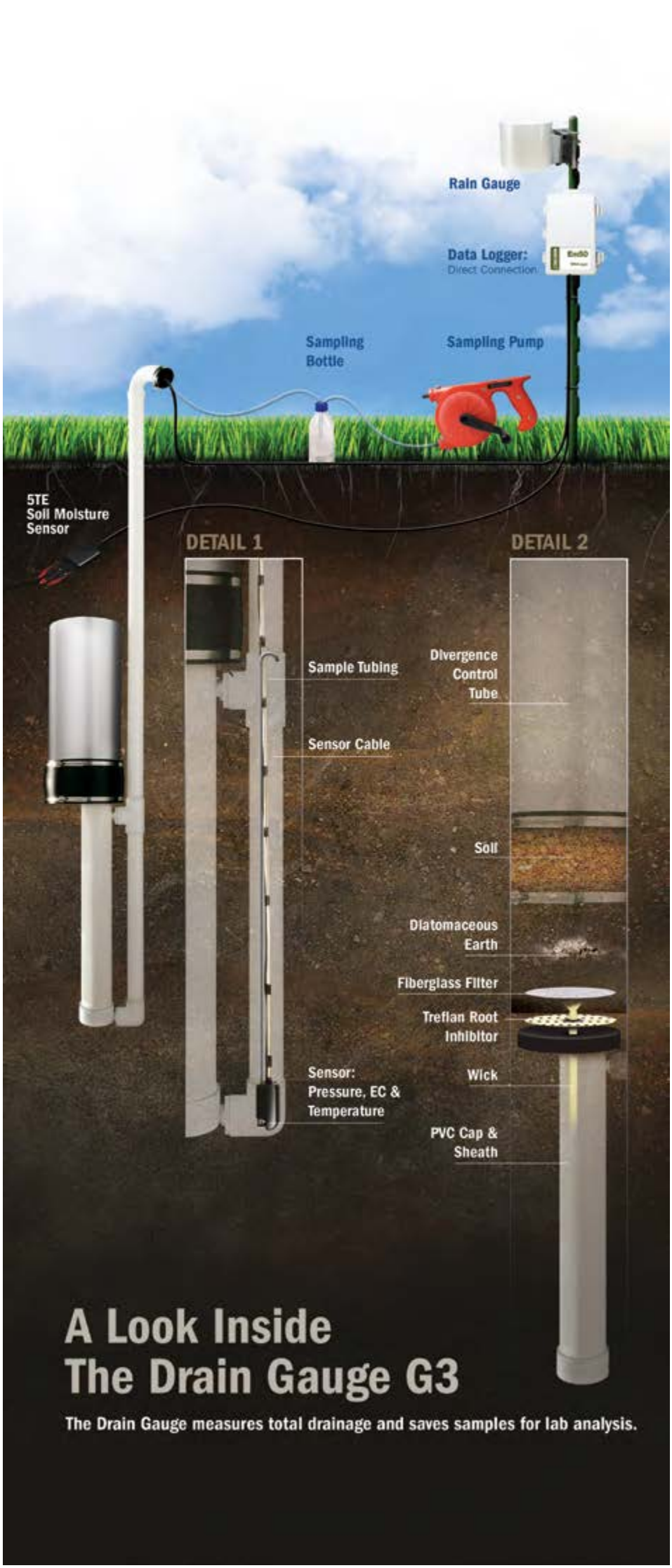
Inert material construction of the tube, sensors, and collection reservoir inhibits chemical reactions.

Measurement surface area: 324 cm^2.
Sampling reservoir volume: 150 mL.
Accuracy: ±10%.
Resolution: 0.1 mm drainage
Suction at intake: 110 cm (11 kPa)
Total length: 147 cm
Divergence control tube (DCT) length: 60 cm.
Measurement time: 10 ms.

Drain Gauge G3
new
SAMPLECAPTURE TECHNOLOGY

Surface port provides easy access to drainage/ temperature/ EC sensor for maintenance.

Measurement surface area: 507 cm
Sampling reservoir volume: 3 L.
Accuracy: ±10%.
Resolution: 0.1 mm drainage
Suction at intake: 110 cm (11 kPa)
Total length: 147 cm
Divergence control tube (DCT) length: 60 cm.
Measurement time: 150 ms.



A Look Inside The Drain Gauge G3

The Drain Gauge measures total drainage and saves samples for lab analysis.

Measure Conductivity, Temperature, and Depth

Continuously monitor groundwater and surface water level changes along with electrical conductivity and temperature.

Decagon's CTD sensor puts much of its complex circuitry in an above-ground data logger. This lowers the per-sensor cost without impacting accuracy and resolution. So instead of relying on a single measurement, you can measure in several different locations without exceeding your budget.

LEARN Online

learn.decagon.com/CTD

Watch a video to learn more about the capabilities of the CTD sensor.

Specifications

Water Depth
Range: 0 to 3.5 m.
Accuracy: ±0.2 % of span at 20˚C.
Resolution: 1 mm.

Electrical Conductivity
Range: 0 to 120 dS/m (mS/cm).
Accuracy: ±0.01 dS/m or ±10%.
Resolution: 0.001 dS/m.

Temperature
Range: -40 to +50°C.
Accuracy: ±1°C.
Resolution: 0.1°C.

Data Logger Compatibility
Em50/Em50G.
Call for compatibility of Data Loggers.

Features

- Robust marine-grade epoxy overmold to resist corrosion in tough environments.
- Compact 3.4 cm diameter sensor body to fit into tight spaces.
- External logger with remote transmission option to deliver the data directly to your desktop.
- Permanent connection to collect data continuously without pulling up the sensor.

Applications

- Aquifer recharge and recovery.
- Saltwater intrusion, desalination, and wastewater.
- Wetland monitoring.
- Groundwater contamination monitoring.
- Surface water monitoring.

Model Heat Movement

Get A Handle On Heat Transfer.

Each KD2 Pro comes factory calibrated and includes *performance verification standards.*

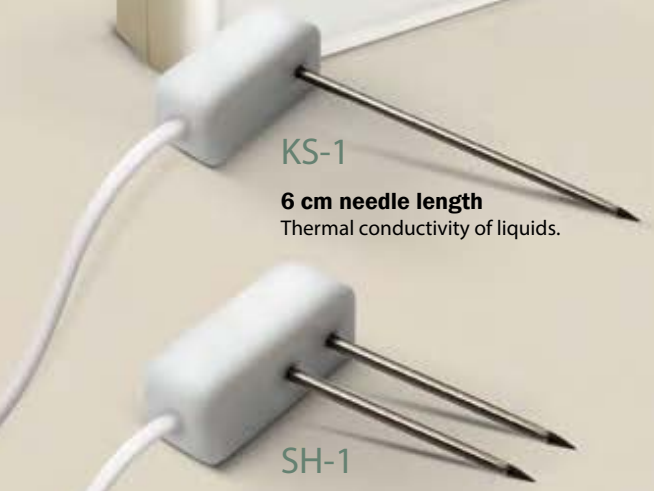
Measure heat transfer in the soil plant atmosphere continuum with the KD2 Pro Thermal Properties Analyser. The KD2 Pro has three interchangeable sensors which measure thermal conductivity, thermal diffusivity and specific heat (heat capacity) along with data storage capabilities and an automatic data collection mode.

The optional RK-1 sensor kit measures rock, concrete and other materials where drilling a pilot hole is required.

- Heated Needle Technology.
- Requires No Calibration.
- Displays in Engineering Units.
- Small Needle Minimises Soil Disturbance.

KS-1

6 cm needle length
Thermal conductivity of liquids.



SH-1

3 cm dual needle length
3 parameters: thermal conductivity, thermal diffusivity, and specific heat.

New - Optional Sensor

RK-1

6 cm needle length
Thermal conductivity/resistivity; for use with stone or cement samples.

TR-1

10 cm needle length
Thermal conductivity or thermal resistivity of soil or porous materials. ASTM and IEEE compliant.

Specifications

Measurement time: 60 Seconds to 10 minutes.
Accuracy*: ± 5 to ± 10% Conductivity/Resistivity. ± 10% Thermal Diffusivity, ± 10% Specific Heat.
Ranges*: K: 0.02 to 4 $Wm^{-1}C^{-1}$, D: 0.1 to 1.0 mm^2s^{-1}, R: 0.5 to 50 $mC\,W^{-1}$, C: 0.5 to 4 $MJ\,m^{-3}C^{-1}$.
Data storage: 4095 readings.
Environment: –50 to 150°C.
Case size: 15.5 x 9.5 x 3.5 cm.
Power: 4 AA Batteries.
Cable: 1 m.

*Accuracy and measurement range vary with sensor type.

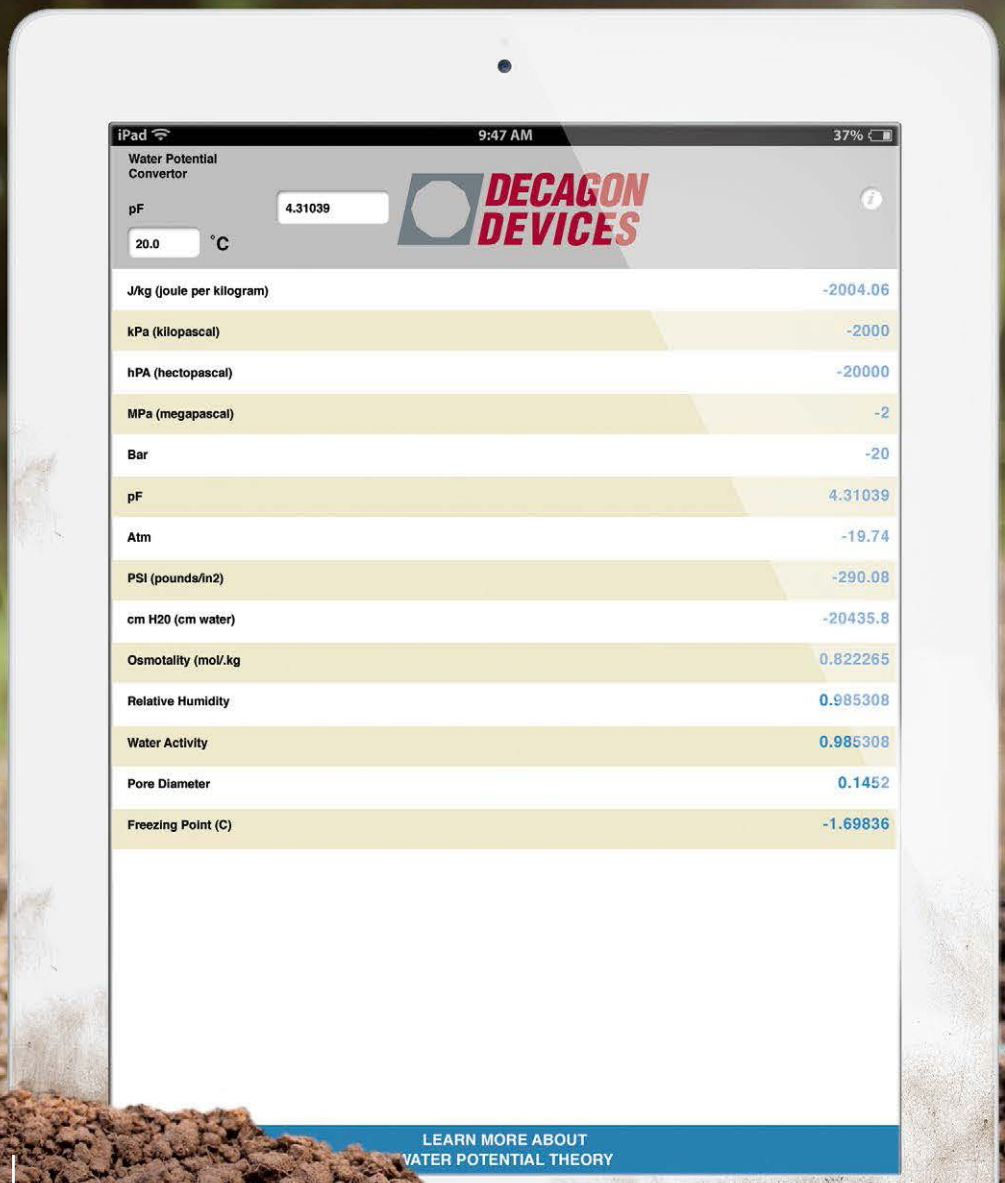
LEARN Online

learn.decagon.com/KD2pro

Watch a three and a half minute video about measuring soil thermal conductivity with the KD2 Pro.

Water Potential Conversions

–On the go.



Google play

Available on the App Store

FREE Decagon Mobile Application now available from the App Store and Google Play. Search for Decagon on either online location.

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